What is claimed is:

1. A variable valve timing control device of an internal combustion engine for controlling a variable valve timing device which varies valve timing of intake valves or exhaust valves driven to open and close by a camshaft by varying a rotation phase of the camshaft (hereinafter, referred to as "camshaft phase") with respect to a crankshaft of the internal combustion engine,

said variable valve timing device comprising:

a first rotating member disposed concentrically with said camshaft and rotationally driven by rotary drive power from said crankshaft;

a second rotating member that rotates integrally with said camshaft;

a phase-varying member that transmits rotary power from said first rotating member to said second rotating member and varies rotation phase of said second rotating member with respect to said first rotating member; and

a motor disposed concentrically with said camshaft so as to control the rotation phase of this phase-varying member,

wherein said variable valve timing device is constructed so that when said valve timing is not to be changed a speed of said motor is matched to a speed of said camshaft to match a turning speed of said phase-varying member to the speed of said camshaft and thereby hold a difference in rotation phase between said first rotating member and said second rotating member steady and thus hold said camshaft phase steady, and when said valve timing is to be

changed the speed of said motor is changed with respect to the speed of said camshaft to change the turning speed of said phase-varying member with respect to the speed of said camshaft and thereby vary the difference in rotation phase between said first rotating member and said second rotating member and thus vary said camshaft phase,

said variable valve timing control device comprising:

required valve timing change rate calculating means for calculating a required valve timing change rate on a basis of a deviation between a target valve timing and an actual valve timing;

required speed difference calculating means for calculating a required speed difference between said motor and said camshaft on a basis of said required valve timing change rate; and

motor control value calculating means for calculating a motor control value so as to control a speed difference between said motor and said camshaft to said required speed difference.

2. A variable valve timing control device of an internal combustion engine according to claim 1, wherein said motor control value calculating means calculates a required motor speed on a basis of the speed of said camshaft and said required speed difference, and said motor control value so as to control the speed of said motor to said required motor speed.

3. A variable valve timing control device of an internal combustion engine according to claim 1, wherein said motor control value calculating means calculates a basic control value for controlling the speed of said motor to a basic motor speed identical with the speed of said camshaft, a change control value for changing the speed of said motor by said required speed difference with

respect to said basic motor speed, and said motor control value on a basis of said basic control value and change control value.

4. A variable valve timing control device of an internal combustion engine according to any one of claim 1 to claim 3, wherein said motor control value calculating means calculates said motor control value so as to control the speed of said motor to the same speed as the speed of said camshaft, when the deviation between the target valve timing and the actual valve timing is below a predetermined value.

5. A variable valve timing control device of an internal combustion engine according to any one of claim 1 to claim 4, wherein said motor control value calculating means calculates said motor control value using at least one among a frictional loss in said variable valve timing device or a parameter correlated therewith, a drive loss on a camshaft side or a parameter correlated therewith, and a counter-electromotive force of said motor or a parameter correlated therewith.

6. A variable valve timing control device of an internal combustion engine according to claim 5, wherein said motor control value calculating means calculates, in correspondence with said required speed difference, the frictional loss in said variable valve timing device or the parameter correlated therewith.

7. A variable valve timing control device of an internal combustion engine according to claim 5 or claim 6, wherein said motor control value calculating means calculates, in correspondence with said required motor speed calculated on a basis of the speed of said camshaft and said required speed difference, the counter-electromotive force of said motor or the parameter

correlated therewith.

8. A variable valve timing control device of an internal combustion engine according to any one of claim 1 to claim 7, wherein said motor control value calculating means corrects said motor control value on a basis of the speed of said motor and/or whether it is increasing or decreasing.

9. A variable valve timing control device of an internal combustion engine according to claim 8, wherein said motor control value calculating means calculates a duty value for duty-controlling power supplied to said motor as said motor control value.

10. A variable valve timing control device of an internal combustion engine according to any one of claim 1 to claim 9, wherein a limit value is set on at least one among said valve timing change rate, the speed difference between said motor and camshaft, and the speed of said motor.

11. A motor-driven variable valve timing control device of an internal combustion engine, which changes a camshaft phase by adjusting a speed of a motor with respect to a speed of a camshaft, comprising;

required valve timing change rate calculating means for calculating a required valve timing change rate on a basis of a deviation between a target valve timing and an actual valve timing;

required speed difference calculating means for calculating a required speed difference between said motor and said camshaft on a basis of said required valve timing change rate; and

motor control value calculating means for calculating a motor control value so as to control a speed difference between said

motor and said camshaft to said required speed difference.

12. A motor-driven variable valve timing control device of an internal combustion engine according to claim 11, wherein said motor control value calculating means calculates a required motor speed on a basis of the speed of said camshaft and said required speed difference, and said motor control value so as to control the speed of said motor to said required motor speed.

13. A motor-driven variable valve timing control device of an internal combustion engine according to claim 11, wherein said motor control value calculating means calculates a basic control value for controlling the speed of said motor to a basic motor speed identical with the speed of said camshaft, a change control value for changing the speed of said motor by said required speed difference with respect to said basic motor speed, and said motor control value on a basis of said basic control value and change control value.

14. A motor-driven variable valve timing control device of an internal combustion engine according to any one of claim 11 to claim 13, wherein said motor control value calculating means calculates said motor control value so as to control the speed of said motor to the same speed as the speed of said camshaft, when the deviation between the target valve timing and the actual valve timing is below a predetermined value.

15. A motor-driven variable valve timing control device of an internal combustion engine according to any one of claim 11 to claim 14, wherein said motor control value calculating means calculates said motor control value using at least one among a frictional loss in said variable valve timing device or a parameter

correlated therewith , a drive loss on a camshaft side or a parameter correlated therewith, and a counter-electromotive force of said motor or a parameter correlated therewith.

16. A motor-driven variable valve timing control device of an internal combustion engine according to claim 15, wherein said motor control value calculating means calculates, in correspondence with said required speed difference, the frictional loss in said variable valve timing device or the parameter correlated therewith.

17. A motor-driven variable valve timing control device of an internal combustion engine according to claim 15 or claim 16, wherein said motor control value calculating means calculates, in correspondence with said required motor speed calculated on a basis of the speed of said camshaft and said required speed difference, the counter-electromotive force of said motor or the parameter correlated therewith.

18. A motor-driven variable valve timing control device of an internal combustion engine according to any one of claim 11 to claim 17, wherein said motor control value calculating means corrects said motor control value on a basis of the speed of said motor and/or whether it is increasing or decreasing.

19. A motor-driven variable valve timing control device of an internal combustion engine according to claim 18, wherein said motor control value calculating means calculates a duty value for duty-controlling power supplied to said motor as said motor control value.

20. A motor-driven variable valve timing control device of an internal combustion engine according to any one of claim 11

to claim 19, wherein a limit value is set on at least one among said valve timing change rate, the speed difference between said motor and camshaft, and the speed of said motor.

21. A variable valve timing control device of an internal combustion engine for controlling a variable valve timing device which varies valve timing of intake valves or exhaust valves driven to open and close by a camshaft by varying a rotation phase of the camshaft (hereinafter, referred to as "camshaft phase") with respect to a crankshaft of the internal combustion engine,

said variable valve timing device comprising:

a first rotating member disposed concentrically with said camshaft and rotationally driven by rotary drive power from said crankshaft;

a second rotating member that rotates integrally with said camshaft;

a phase-varying member that transmits rotary power from said first rotating member to said second rotating member and varies rotation phase of said second rotating member with respect to said first rotating member; and

a motor disposed concentrically with said camshaft so as to control the rotation phase of this phase-varying member,

wherein said variable valve timing device is constructed so that when said valve timing is not to be changed a speed of said motor is matched to a speed of said camshaft to match a turning speed of said phase-varying member to the speed of said camshaft and thereby hold a difference in rotation phase between said first rotating member and

said second rotating member steady and thus hold said camshaft phase steady, and when said valve timing is to be changed the speed of said motor is changed with respect to the speed of said camshaft to change the turning speed of said phase-varying member with respect to the speed of said camshaft and thereby vary the difference in rotation phase between said first rotating member and said second rotating member and thus vary said camshaft phase,

said variable valve timing control device comprising:

a crank angle sensor for outputting a crank angle signal at intervals of a predetermined crank angle;

a cam angle sensor for outputting a cam angle signal at intervals of a predetermined cam angle;

cam angle signal output time valve timing calculating means for calculating, every time said cam angle signal is outputted, an actual valve timing at the time of outputting of the cam angle signal on a basis of the cam angle signal and the crank angle signal;

valve timing variation calculating means for calculating a valve timing variation with a predetermined computation period on a basis of a difference between the speed of said motor and the speed of said camshaft;

final valve timing calculating means for calculating a final actual valve timing with a predetermined computation period on a basis of a calculated value of the actual valve timing at the time of outputting of said cam angle signal and a calculated value of the valve timing variation.

22. A variable valve timing control device of an internal combustion engine according to claim 21, wherein said valve timing

variation calculating means has means for calculating a valve timing variation per computation period and accumulating the calculated values, and means for resetting an accumulated value of the valve timing variation every time said cam angle signal is outputted, and wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing at a time of the most recent outputting of the cam angle signal the accumulated value of subsequent valve timing variation.

23. A variable valve timing control device of an internal combustion engine according to claim 21 or claim 22, wherein said valve timing variation calculating means uses a 1/2 value of a speed of said crankshaft detected on a basis of an output period of the crank angle signal of said crank angle sensor as a speed data of said camshaft.

24. A variable valve timing control device of an internal combustion engine according to any one of claim 21 to claim 23, wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing of when the internal combustion engine stops an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, while the internal combustion engine is stopped.

25. A variable valve timing control device of an internal combustion engine according to any one of claim 21 to claim 24, wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of

the actual valve timing at a time of a last outputting of the cam angle signal before a failure an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, when said cam angle sensor fails.

26. A motor-driven variable valve timing control device of an internal combustion engine, which changes a camshaft phase by adjusting a speed of a motor with respect to a speed of a camshaft, comprising;

a crank angle sensor for outputting a crank angle signal at intervals of a predetermined crank angle;

a cam angle sensor for outputting a cam angle signal at intervals of a predetermined cam angle;

cam angle signal output time valve timing calculating means for calculating, every time said cam angle signal is outputted, an actual valve timing at the time of outputting of the cam angle signal on a basis of the cam angle signal and the crank angle signal;

valve timing variation calculating means for calculating a valve timing variation with a predetermined computation period on a basis of a difference between the speed of said motor and the speed of said camshaft;

final valve timing calculating means for calculating a final actual valve timing with a predetermined computation period on a basis of a calculated value of the actual valve timing at the time of outputting of said cam angle signal and a calculated value of the valve timing variation.

27. A variable valve timing control device of an internal combustion engine according to claim 26, wherein said valve timing

variation calculating means has means for calculating a valve timing variation per computation period and accumulating the calculated values, and means for resetting an accumulated value of the valve timing variation every time said cam angle signal is outputted, and wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing at a time of the most recent outputting of the cam angle signal the accumulated value of subsequent valve timing variation.

28. A variable valve timing control device of an internal combustion engine according to claim 26 or claim 27, wherein said valve timing variation calculating means uses a 1/2 value of a speed of said crankshaft detected on a basis of an output period of the crank angle signal of said crank angle sensor as a speed data of said camshaft.

29. A variable valve timing control device of an internal combustion engine according to any one of claim 26 to claim 28, wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing of when the internal combustion engine stops an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, while the internal combustion engine is stopped.

30. A variable valve timing control device of an internal combustion engine according to any one of claim 26 to claim 29, wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of

the actual valve timing at a time of a last outputting of the cam angle signal before a failure an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, when said cam angle sensor fails.

31. A motor-driven variable valve timing control device of an internal combustion engine, which changes a camshaft phase by adjusting a speed of a motor with respect to a speed of a camshaft, comprising;

a crank angle sensor for outputting a crank angle signal at intervals of a predetermined crank angle;

a cam angle sensor for outputting a cam angle signal at intervals of a predetermined cam angle;

a motor angle sensor for outputting a motor angle signal at intervals of a predetermined motor angle;

means for calculating a variation of a motor rotation angle;

means for calculating a variation of a camshaft rotation angle;

cam angle signal output time valve timing calculating means for calculating, every time said cam angle signal is outputted, an actual valve timing at a time of outputting of the cam angle signal on a basis of the cam angle signal and the crank angle signal;

valve timing variation calculating means for calculating a valve timing variation on a basis of a difference between the variation of the motor rotation angle and the variation of the camshaft rotation angle;

final valve timing calculating means for calculating a final actual valve timing on a basis of a calculated value of the actual

valve timing at the time of outputting of said cam angle signal and a calculated value of the valve timing variation.

32. A variable valve timing control device of an internal combustion engine according to claim 31, wherein said valve timing variation calculating means has means for calculating a valve timing variation per computation period and accumulating the calculated values, and means for resetting an accumulated value of the valve timing variation every time said cam angle signal is outputted, and wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing at a time of the most recent outputting of the cam angle signal the accumulated value of subsequent valve timing variation.

33. A variable valve timing control device of an internal combustion engine according to claim 31 or claim 32, wherein the variation of the motor rotation angle is calculated from a variation of a motor angle counter which counts based on a number of outputting of the motor angle sensor for outputting the motor angle signal at intervals of the predetermined motor angle.

34. A variable valve timing control device of an internal combustion engine according to any one of claim 31 to claim 33, wherein the variation of the camshaft rotation angle is a 1/2 value of a crank angle variation calculated from a variation of a crank angle counter which counts based on a number of outputting of the crank angle sensor for outputting the crank angle signal at intervals of the predetermined crank angle.

35. A variable valve timing control device of an internal combustion engine according to any one of claim 31 to claim 34,

wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing of when the internal combustion engine stops an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, while the internal combustion engine is stopped.

36. A variable valve timing control device of an internal combustion engine according to any one of claim 31 to claim 35, wherein said final valve timing calculating means calculates the final actual valve timing by adding to the calculated value of the actual valve timing at a time of a last outputting of the cam angle signal before a failure an accumulated value of subsequent valve timing variation, or with an accumulated value of valve timing variation from a reference position, when said cam angle sensor fails.

37. A variable valve timing control device of an internal combustion engine, comprising:

a variable valve timing device which varies valve timing of intake valves or exhaust valves of the internal combustion engine with a gear mechanism; and

control means for controlling the variable valve timing device,

wherein said control means executes rate-limiting control for limiting a valve timing change rate to a predetermined rate or less, when an actual valve timing is in a predetermined rate-limited region set in a vicinity of a limit position of a movable range of the variable valve timing device.

38. A variable valve timing control device of an internal combustion engine according to claim 37, wherein said control means does not execute the rate-limiting control when the actual valve timing is being changed in an opposite direction from a limit position of the rate-limited region even though the actual valve timing is in the rate-limited region.

39. A variable valve timing control device of an internal combustion engine according to claim 37 or claim 38, wherein said rate-limiting region is set on a basis of a valve timing variation needed to slow the valve timing change rate to the predetermined rate and/or on an actual valve timing detection error.

40. A variable valve timing control device of an internal combustion engine according to any one of claim 37 to claim 39, further comprising:

reference position learning means for learning a reference position of the valve timing,

wherein said control means executes rate-limiting control for limiting the valve timing change rate to the predetermined rate or less, when said reference position learning means has not completed learning of the reference position.

41. A variable valve timing control device of an internal combustion engine, comprising:

a variable valve timing device which varies valve timing of intake valves or exhaust valves of the internal combustion engine with a gear mechanism;

control means for controlling the variable valve timing device; and

reference position learning means for learning a reference

position of the valve timing,

wherein said control means executes rate-limiting control for limiting a valve timing change rate to a predetermined rate or less, when said reference position learning means has not completed learning of the reference position.

42. A variable valve timing control device of an internal combustion engine according to claim 40 or claim 41, wherein said control means executes said rate-limiting control in a region where a difference between an actual valve timing and a limit position of a movable range of said variable valve timing device is within a predetermined value, when said reference position learning means has not completed learning of the reference position.

43. A variable valve timing control device of an internal combustion engine according to any one of claim 40 to claim 42, wherein said control means sets a target valve timing in accordance with the valve timing change rate limited to the predetermined rate or less by said rate-limiting control, when executing variable valve timing control in a state that said reference position learning means has not completed learning of the reference position.

44. A variable valve timing control device of an internal combustion engine according to any one of claim 40 to claim 43, wherein said reference position learning means prohibits normal variable valve timing control until reference position learning has been completed and executes only reference position learning.

45. A variable valve timing control device of an internal combustion engine, comprising:

a variable valve timing device which varies valve timing

of intake valves or exhaust valves of the internal combustion engine with a gear mechanism;

control means for controlling the variable valve timing device;

reference position learning means for learning a reference position of the valve timing; and

learning abnormality determination means for determining whether or not there has been an abnormality in reference position learning executed by said reference position learning means,

wherein said control means executes rate-limiting control for limiting a valve timing change rate to a predetermined rate or less, when said learning abnormality determination means determines that there has been an abnormality in reference position learning.

46. A variable valve timing control device of an internal combustion engine according to claim 45, wherein said learning abnormality determination means determines that there has been an abnormality in reference position learning, when a reference position learning value of said reference position learning means exceeds a predetermined guard value.

47. A variable valve timing control device of an internal combustion engine according to claim 45 or claim 46, wherein said control means sets a target valve timing in accordance with the valve timing change rate limited to the predetermined rate or less by said rate-limiting control, when executing variable valve timing control in a state that said learning abnormality determination means determines that there has been an abnormality in reference position learning.

48. A variable valve timing control device of an internal combustion engine according to any one of claim 45 to claim 47, wherein said control means prohibits normal variable valve timing control and executes only reference position learning until said learning abnormality determination means determines that there is no abnormality in reference position learning.

49. A variable valve timing control device of an internal combustion engine according to any one of claim 40 to claim 48, wherein said reference position leaning means learns the reference position before the internal combustion engine is started.

50. A variable valve timing control device of an internal combustion engine according to claim 49, further comprising start prohibiting means for prohibiting start control of said internal combustion engine until said reference position learning has been completed.

51. A variable valve timing control device of an internal combustion engine according to claim 50, wherein said start prohibiting means limits execution of a processing for prohibiting start control of said internal combustion engine until said reference position learning has been completed to a predetermined time from when an ignition switch is turned on.

52. A variable valve timing control device of an internal combustion engine according to any one of claim 37 to claim 51, wherein said gear mechanism comprising:

a first rotating member disposed concentrically with a camshaft and rotationally driven by rotary drive power from a crankshaft;

a second rotating member that rotates integrally with said

camshaft; and

a phase-varying member that transmits rotary power from said first rotating member to said second rotating member and varies rotation phase of said second rotating member with respect to said first rotating member, and

wherein drive power transmitting means between said first rotating member and said phase-varying member and/or drive power transmitting means between said second rotating member and said phase-varying member is constructed by a gear wheel, and

further comprising a motor for controlling a rotation phase of said phase-varying member, and

wherein said control means, when said valve timing is not to be changed, matches a speed of said motor to a speed of said camshaft to match a turning speed of said phase-varying member to the speed of said camshaft and thereby hold a difference in rotation phase between said first rotating member and said second rotating member steady and thus hold said valve timing steady, and when said valve timing is to be changed, changes the speed of said motor with respect to the speed of said camshaft to change the turning speed of said phase-varying member with respect to the speed of said camshaft and thereby vary the difference in rotation phase between said first rotating member and said second rotating member and thus vary said valve timing.

53. A variable valve timing control device of an internal combustion engine, comprising:

a variable valve timing device for varying valve timing of intake valves or exhaust valves by means of a drive source provided separately from the internal combustion engine;

valve timing control means for controlling the variable valve timing device so that an actual valve timing is matched to a target valve timing (hereinafter, referred to as "variable valve timing control"); and

rotation state determination means for determining a rotation state of the internal combustion engine,

wherein said valve timing control means performs actual valve timing calculation and/or variable valve timing control when said rotation state determination means determines that the internal combustion engine is rotating forward or is stopped.

54. A variable valve timing control device of an internal combustion engine according to claim 53, wherein said rotation state determination means determines the rotation state of the internal combustion engine on a basis of an output signal from a crank angle sensor and/or a cam angle sensor.

55. A variable valve timing control device of an internal combustion engine according to claim 53 or claim 54, wherein said rotation state determination means determines that the internal combustion engine is rotating forward when the internal combustion engine is rotating and it is determined that an engine speed at a time when a starter is being turned on or when the starter is turned off is not less than a predetermined value.

56. A variable valve timing control device of an internal combustion engine according to any one of claim 53 to claim 55, further comprising a drive motor having a rotating shaft synchronously rotating with said camshaft, wherein said rotation state determination means determines the rotation state of the internal combustion engine based on a rotation state of the motor.

57. A variable valve timing control device of an internal combustion engine according to claim 56, wherein said rotation state determination means determines that the internal combustion engine is rotating forward when a state determined that the internal combustion engine is rotating forward based on the rotation state of the motor after the starter is turned off is continued for a predetermined time.

58. A variable valve timing control device of an internal combustion engine according to claim 56 or claim 57, wherein said variable valve timing device comprising:

a first rotating member disposed concentrically with the camshaft and rotationally driven by rotary drive power from a crankshaft;

a second rotating member that rotates integrally with the camshaft;

a phase-varying member that transmits rotary power from said first rotating member to said second rotating member and varies rotation phase of said second rotating member with respect to said first rotating member; and

a motor disposed concentrically with said camshaft so as to control the rotation phase of this phase-varying member,

wherein said variable valve timing device is constructed so that when said valve timing is not to be changed a speed of said motor is matched to a speed of said camshaft to match a turning speed of said phase-varying member to the speed of said camshaft and thereby hold a difference in rotation phase between said first rotating member and said second rotating member steady and thus hold said valve timing steady, and when said valve timing is to

be changed the speed of said motor is changed with respect to the speed of said camshaft to change the turning speed of said phase-varying member with respect to the speed of said camshaft and thereby vary the difference in rotation phase between said first rotating member and said second rotating member and thus vary said valve timing, and

wherein said rotation state determination means determines the rotation state of the internal combustion engine based on the rotation state of the motor when said variable valve timing device holds the valve timing steady.

59. A variable valve timing control device of an internal combustion engine according to any one of claim 53 to claim 58, wherein said valve timing control means controls an actuation amount of said variable valve timing device and/or a drive power amount supplied to said variable valve timing device after the engine is stopped to make the actual valve timing match the target valve timing, when said variable valve timing control is executed while the internal combustion engine is stopped.

60. A variable valve timing control device of an internal combustion engine according to claim 59, wherein in a case where said variable valve timing device is of a type driven by a motor said valve timing control means controls a rotation amount of said motor as the actuation amount of said variable valve timing device.

61. A variable valve timing control device of an internal combustion engine according to claim 59, wherein in a case where said variable valve timing device is of a type driven by a motor said valve timing control means controls a supplied electric power amount as the drive power amount supplied to said variable valve

timing device.

62. A variable valve timing control device of an internal combustion engine according to claim 59, wherein in a case where said variable valve timing device is of a type driven by a hydraulic pressure said valve timing control means controls a supplied oil amount as the drive power amount supplied to said variable valve timing device.

63. A variable valve timing control device of an internal combustion engine according to any one of claim 53 to claim 62, wherein said valve timing control means controls said valve timing to a reference position when said rotation state determination means determines a reverse rotation of the internal combustion engine.

64. A variable valve timing control device of an internal combustion engine according to claim 63, wherein in a case where said reference position is set to a limit position of a movable range of said variable valve timing device said valve timing control means controls said valve timing to said reference position while the internal combustion engine is rotating backward or while the internal combustion engine is stopped after rotating backward.

65. A variable valve timing control device of an internal combustion engine according to claim 64, wherein said valve timing control means determines on a basis of a control output to said variable valve timing device whether or not the actual valve timing reaches the reference position set to the limit position of the movable range of said variable valve timing device.

66. A variable valve timing control device of an internal combustion engine according to claim 64, wherein said valve timing

control means determines on a basis of an operating state of said variable valve timing device whether or not the actual valve timing reaches the reference position set to the limit position of the movable range of said variable valve timing device.

67. A variable valve timing control device of an internal combustion engine according to claim 63, wherein in a case where said reference position is set to an intermediate position in a movable range said valve timing control means controls the actual valve timing to said reference position while the internal combustion engine is stopped after rotating backward.

68. A variable valve timing control device of an internal combustion engine according to any one of claim 53 to claim 67, wherein said valve timing control means changes an operating condition of said variable valve timing device in correspondence with a battery voltage when a speed of the internal combustion engine is lower than a predetermined value.

69. A variable valve timing control device of an internal combustion engine, comprising:

a variable valve timing device for varying valve timing of intake valves or exhaust valves by means of a drive source provided separately from the internal combustion engine; and

valve timing control means for controlling the variable valve timing device

wherein said valve timing control means changes an operating condition of said variable valve timing device in correspondence with a battery voltage when a speed of the internal combustion engine is lower than a predetermined value.

70. A variable valve timing control device of an internal

combustion engine according to claim 68 or claim 69, wherein said valve timing control means limits an actuation speed of said variable valve timing device when said battery voltage is within a range from a first predetermined value to a second predetermined value lower than that, and prohibits an operation of said variable valve timing device when the battery voltage is lower than said second predetermined value.